



SF1511 Numerical Methods and Basic Programming 9.0 credits

Numeriska metoder och grundläggande programmering

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

The Head of School at the SCI School has decided on 2019-10-05 to establish this syllabus as from HT 2019 (file number S-2019-1940).

Decision to discontinue this course

<p>The decommissioning period commences during HT 2019, the last examination period is VT 2021, period 4, and after the last completed examination opportunity in VT 2021 the course is discontinued.</p>

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

A general aim with the course is to give the student the understanding that numerical methods and programming techniques are needed to make reliable and efficient simulations of technical and scientific processes based on mathematical models.

On completion of the course, the student should be able to

- identify different mathematical problems and reformulate them in a way that is appropriate for numerical treatment
- choose appropriate numerical method for treatment of the given problem
- explain choice of method by accounting for advantages and limitations
- choose an algorithm that implies efficient calculations and implement it in a programming language suited for calculations e.g. Matlab
- present the results on a relevant and illustrative way
- estimate the reliability of the results
- break down larger problem in manageable parts and write functions for these in the programming language
- use control and data structures
- handle files in different ways, both for input and output
- use functions from the library of the programming language (e.g. Matlab's library) for calculation, visualisation and efficient programming
- write well-structured programs in the programming language.

Course contents

Basic computer concepts. Programming in a modern programming language for technical calculations (Matlab). Using graphical routines. Problem-solving through division into sub problems. Program structuring. Using mathematical software to solve engineering mathematical problems, make numerical experiments and present solutions. Basic ideas and concepts within numerical methods: algorithms, computational cost, local linearisation, iteration, extrapolation, discretisation, convergence, stability. Estimation of reliability: parameter sensitivity, experimental perturbation calculation. Numerical methods for linear and non-linear systems of equations, integrals, differential equations, interpolation, the least squares method.

Specific prerequisites

Examination

- LABA - Laboratory Works, 1.5 credits, grading scale: P, F

- LABB - Laboratory Works, 1.5 credits, grading scale: P, F
- LABC - Laboratory Works, 1.5 credits, grading scale: P, F
- LABD - Laboratory Works, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

In this course, the code of honour of the school is applied, see: <http://www.sci.kth.se/institutioner/math/avd/na/utbildning/hederskodex-for-studenter-och-larare-vid-kurser-pa-avdelningen-for-numerisk-analys-1.357185>

Other requirements for final grade

An examination (TEN1; 3 credits).

Laboratory assignments (LABA; 1.5 credits), (LABB; 1.5 credits), (LABC; 1.5 credits), (LABD; 1.5 credits).

Transitional regulations

- **Written examination:** Four re-exams are offered for two years after the last course was given (re-exams are planned in the re-examination week in December and the re-examination week in June)
- **Approved oral and written presentation of labs and project work:** There will be events for presenting lab and project work at the end of each semester, the last scheduled accounting being during VT 2021.
- **During HT 2019, an extralearning opportunity is offered:** A review of theory and exercises (16 lectures / lessons) to give students a better opportunity to complete their remaining parts and thus the whole course. Student counsellors and students were informed about this at the end of VT 2019, the students need to register for this special opportunity.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.